Measuring Forest Structure: A Vertical Perspective

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Overview

The height of trees and the shape and density of forest canopies have important implications for the management of timber, wildfire, insects, invasive species, and wildlife habitat. Despite this importance, most methods for measuring these forest characteristics remain time intensive, expensive, or inaccurate.
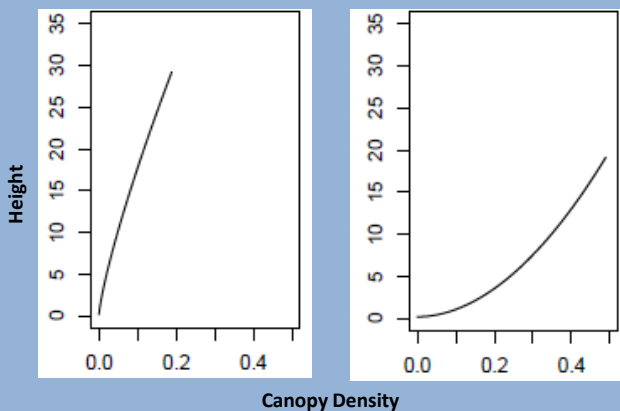
My research focuses on two different methods for quickly and efficiently measuring canopy density, canopy shape, and tree heights: vertical point sampling with a camera and laser point quadrat sampling.

Vertical point sampling with a camera is a method by which various forest characteristics can be quickly estimated using a vertical photo of the canopy (Figure 1). Laser point sampling is a method that uses a handheld laser rangefinder to measure canopy structure and density (Figure 2).

Figure 1: A vertical photo used to measure forest structure.

Summary of Findings

1. As long as terrain is moderate (the majority of slopes less than 35 degrees), vertical point sampling with a camera can be conducted with complete disregard for slope.

2. The incorporation of new statistical methods into the analysis of laser point sampling drastically reduces the number of sample points needed to characterize forest canopy shape and density. This leads to a large reduction in the time and cost needed to conduct this sampling method.

Conclusions

My research shows that both vertical point sampling and laser point sampling are quick, simple, and inexpensive methods for assessing various forest characteristics. These methods should prove useful to private landowners, foresters, or citizen scientists for assessing the structure and health of forests.

Figure 2: Two examples of canopy profiles estimates obtained using laser point quadrat sampling.

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